



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/762,514	01/23/2004	Gaku Minamihaba	04329.2959-01	5239

22852 7590 10/20/2005

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER

CHEN, ERIC BRICE

ART UNIT	PAPER NUMBER
----------	--------------

1765

DATE MAILED: 10/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/762,514

Applicant(s)

MINAMIHABA ET AL.

Examiner

Eric B. Chen

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 January 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,7-10 and 21-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,7-10 and 21-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☒ Certified copies of the priority documents have been received in Application No. 10/303,855.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>1/23/04; 11/4/04</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

1. This application appears to be a division of Application No. 10/303,855, filed Nov. 26, 2002. A later application for a distinct or independent invention, carved out of a pending application and disclosing and claiming only subject matter disclosed in an earlier or parent application is known as a divisional application or "division." The divisional application should set forth the portion of the earlier disclosure that is germane to the invention as claimed in the divisional application.
2. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 10/303,855, filed on Nov. 26, 2002.
3. Applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1765

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-3 and 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hellring et al. (U.S. Patent Appl. Pub. No. 2004/0077295).

7. As to claim 1, Hellring discloses a polishing slurry for CMP (paragraph 0002) of Cu (paragraph 0017), which comprises: a first complexing agent containing quinaldinic acid (paragraph 0030); or a second complexing agent containing quinolinic acid (paragraph 0030). Hellring does not expressly disclose use of a first complexing agent containing quinaldinic acid and a second complexing agent containing quinolinic acid. However, there is a suggestion that the acids used as complexing agents may be mixed (claim 14; paragraph 0030). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a first complexing agent containing quinaldinic acid and a second complexing agent containing quinolinic acid. One who is skilled in the art would be motivated to use a combination of acids because they are used for the same purpose in the polishing slurry and because there is a suggestion in Hellring for the mixing of acids used for complexing agents.

Art Unit: 1765

8. As to claim 2, Hellring does not expressly disclose a mixing ratio of said first complexing agent to said second complexing agent is within the range of 2:8 to 8:2 based on weight. However, Hellring discloses that concentration of complexing agent can be varied (paragraph 0031) and there is a suggestion of the mixing acids used for complexing agents (claim 14; paragraph 0030). Moreover, Hellring teaches, by disclosing that the complexing agent concentration may be varied, that changing the concentration appears to reflect a result-effective variable which can be optimized. See MPEP § 2144.05 II. Complexing agent concentration (or ratio) can be varied according, depending on the desired outcome the CMP step. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a mixing ratio of said first complexing agent to said second complexing agent is within the range of 2:8 to 8:2 based on weight. One who is skilled in the art would be motivated to optimize through routine experimentation of complexing agent concentrations or ratios. See MPEP § 2144.05 II.

9. As to claim 3, Hellring does not expressly disclose a mixing ratio of said first complexing agent to said second complexing agent is within the range of 4:6 to 6:4 based on weight. However, Hellring discloses that concentration of complexing agent can be varied (paragraph 0031) and there is a suggestion of the mixing acids used for complexing agents (claim 14; paragraph 0030). Moreover, Hellring teaches, by disclosing that the complexing agent concentration may be varied, that changing the concentration appears to reflect a result-effective variable which can be optimized. See MPEP § 2144.05 II. Complexing agent concentration (or ratio) can be varied according,

Art Unit: 1765

depending on the desired outcome the CMP step. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a mixing ratio of said first complexing agent to said second complexing agent is within the range of 4:6 to 6:4 based on weight. One who is skilled in the art would be motivated to optimize through routine experimentation of complexing agent concentrations or ratios.

See MPEP § 2144.05 II.

10. As to claim 7, Hellring discloses that the polishing slurry further comprises an oxidizing agent selected from the group consisting of persulfuric acid, ammonium persulfate and hydrogen peroxide (paragraph 0028).

11. As to claim 8, Hellring discloses that the polishing slurry further comprises polishing particles comprising a material selected from the group consisting of silica, alumina, zirconia and ceria (paragraph 0019).

12. As to claim 9, Hellring discloses that the polishing slurry further comprises a polishing rate promoting agent selected from the group consisting of glycine and alanine (paragraph 0030).

13. As to claim 10, Hellring discloses that the polishing slurry further comprises a surfactant (paragraph 0049).

Claim Rejections - 35 USC § 103

14. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hellring, in view of Uchikura et al. (U.S. Patent No. 6,579,153).

Art Unit: 1765

15. As to claim 21, Hellring discloses that the polishing particles comprise silica. Hellring does not expressly disclose that the polishing particles comprises colloidal silica. However, Uchikura discloses a polishing slurry for CMP of Cu (column 2, lines 39-42), including the use of colloidal silica (column 7, lines 57-62). Moreover, Uchikura's polishing slurry can produce sufficiently flattened copper, barrier metal film, and insulating film surfaces with high precision (column 2, lines 53-58). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use colloidal silica. One who is skilled in the art would be motivated to use a polishing slurry for CMP that produces sufficiently flattened copper, barrier metal film, and insulating film surfaces with high precision.

16. As to claim 22, Hellring does not expressly disclose that the surfactant is one selected from the group consisting of potassium dodecylbenzenesulfonate and ammonium dodecylbenzenesulfonate. However, Uchikura discloses a polishing slurry for CMP of Cu (column 2, lines 39-42), including potassium dodecylbenzenesulfonate and ammonium dodecylbenzenesulfonate surfactants (column 13, lines 40-43). Moreover, Uchikura's polishing slurry can produce sufficiently flattened copper, barrier metal film, and insulating film surfaces with high precision (column 2, lines 53-58). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a surfactant selected from the group consisting of potassium dodecylbenzenesulfonate and ammonium dodecylbenzenesulfonate. One who is skilled in the art would be motivated to use a surfactant from a polishing slurry for CMP

Art Unit: 1765

that produces sufficiently flattened copper, barrier metal film, and insulating film surfaces with high precision.

Claim Rejections - 35 USC § 103

17. Claims 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hellring, in view of Kakizawa et al. (U.S. Patent No. 6,310,019).

18. As to claim 23, Hellring does not expressly disclose that the surfactant is acetylene diol-based nonion. However, Kakizawa discloses a cleaning fluid for CMP Cu (column 2, lines 27-24), including acetylene diol-based nonion surfactant (column 2, lines 35-49; column 3, lines 10-15; column 5, lines 1-10, lines 35-40). Kakizawa's cleaning fluid has the advantage of not causing corrosion/oxidation or surface roughness on the copper surface (column 2, lines 27-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an acetylene diol-based nonion surfactant. One who is skilled in the art would be motivated to use a surfactant from a formulation that has the advantage of not causing corrosion/oxidation or surface roughness on the copper surface.

Claim Rejections - 35 USC § 103

19. Claims 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hellring, in view of Uchikura, in further view of Kakizawa.

20. As to claim 24, Hellring does not expressly disclose that the surfactant comprises potassium dodecylbenzenesulfonate and acetylene diol-based nonion. However,

Art Unit: 1765

Uchikura discloses a polishing slurry for CMP of Cu (column 2, lines 39-42), including potassium dodecylbenzenesulfonate and ammonium dodecylbenzenesulfonate surfactants (column 13, lines 40-43). Moreover, Uchikura's polishing slurry can produce sufficiently flattened copper, barrier metal film, and insulating film surfaces with high precision (column 2, lines 53-58). Kakizawa discloses a cleaning fluid for CMP Cu (column 2, lines 27-24), including an acetylene diol-based nonion surfactant (column 2, lines 35-49; column 3, lines 10-15; column 5, lines 1-10, lines 35-40). Kakizawa's cleaning fluid has the advantage of not causing corrosion/oxidation or surface roughness on the copper surface (column 2, lines 27-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a surfactant comprising potassium dodecylbenzenesulfonate and acetylene diol-based nonion. One who is skilled in the art would be motivated to use a surfactant from a polishing slurry for CMP that produces sufficiently flattened copper, barrier metal film, and insulating film surfaces with high precision. Moreover, one who is skilled in the art would be motivated to use a surfactant from a formulation that has the advantage of not causing corrosion/oxidation or surface roughness on the copper surface. Furthermore, one who is skilled in the art would be motivated to combine two surfactants, both of which have beneficial properties when treating copper.

Art Unit: 1765

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Saki et al. (U.S. Patent No. 6,440,186) discloses a CMP slurry for copper with quinaldinic acid as a chelating agent.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B. Chen whose telephone number is (571) 272-2947. The examiner can normally be reached on Monday through Friday, 8AM to 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

EBC

Oct. 13, 2005



NADINE G. NORTON
SUPERVISORY PATENT EXAMINER

